

REMARKS

Following the Decision on Appeal Applicants are now submitting a Request for Continued Examination. Applicants are submitting this Amendment with the RCE in order to cancel claims 1-36 which were previously present in the application and introduce claims 37 to 48. These claims correspond to the allowed claims from the European Patent Application. These claims include method claims 37-44, product claims 45 and 46 and system claims 47 and 48. It is noted that claims 45 and 46 are similar to original claims 9 and 10 and the claims 47 and 48 are similar to original claims 11 and 12.

Applicants submit that the present claims are allowable. In particular, the Examiner is requested to take notice that these claims have been submitted to the European Patent Office in corresponding European Patent Application 01 121 026.7. For the Examiner's convenience, Applicants are submitting herewith a copy of the first Official Action dated February 24, 2004. Applicants are also submitting a response to this action which was filed in the European Patent Office. The second Official Action dated February 14, 2007 is also being submitted. A new set of claims which corresponds to the present claims being presented in the US RCE application are also attached which are being filed in the European Application.

Applicants believe that the European Examiner will allow these claims which are presently being submitted in response to the second Official Action in the European Patent application.

Concerning the present claims, Applicants wish to point out that there is a theory concerning "co-doping" that believes that when a complex of acceptor and donor (acceptor-donor complex) is formed in a crystal, the level of independent acceptor atom regularly becomes deep when the band gap widens and carriers of most holes do not appear in a valence band so that a p-type semiconductor is not formed. However, by using a co-doping method, a shallow acceptor level is created due to the binding energy of the donor and acceptor. Under this theory, it would be possible to form a donor-acceptor complex by simultaneously introducing acceptors and donors as impurities during crystal growth. It has also been tried to create material having acceptor concentrations or having low activation energy, but this has not yet succeeded. This is because the donors and acceptors cannot easily move in a crystal and there is little possibility

that they can move around enough to meet and create a complex. However, in the subject invention, the inventors have noted that atoms move very easily on a crystal surface, so that the donor and acceptor are simultaneously introduced into a crystal surface when growing an atomic layer of crystal growth alternately, or in another case, they are introduced into an adjoining layer so that donor atoms and acceptors atoms freely move and associate with each other. As a result, the above described donor-acceptor complex can be easily created. Figure 10 of the present application shows experimental results of such a method. Applicants are also submitting herewith an additional Figure A which shows that the activation energy (E_a) is significantly reduced and the donor-acceptor complex is created. As a result, the inventors have succeeded in realizing a hole concentration of $1E19/cm^3$ which has never been obtained in GaN and a hole concentration of $5E18/cm^3$ in AlGaIn.

The doping method shown in Nishizawa et al. discloses that the compound semiconductor becomes a P-type when the acceptor is introduced into an atomic layer with a certain timing and becomes an N-type when the donor is introduced into another atomic layer, which is based on the "co-doping" theory and uses a single atom. In this case, it is still not possible in principal to obtain a high concentration hole in a material such as GaAlIn having a wide band gap. Therefore, Applicants submit that the present invention is not suggested by Nishizawa et al. and that the only possible realization of the results described in the present application are through a co-doping method such as that described.

In view of the above, Applicants submit that the present claims are allowable over the cited references.

Conclusion

In view of the above remarks, it is believed that the claims are now allowable and that the application is fully in allowable form. Accordingly, an early and favorable action is respectfully requested.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Robert F. Gnuse Reg. No. 27,295

Application No. 09/941,612
Amendment dated June 26, 2007
Reply to Office Action of April 27, 2007

Docket No : 1794-0141P

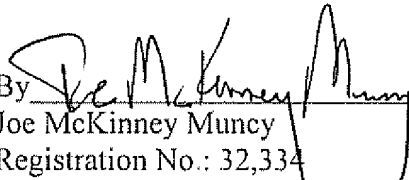
at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.


Dated: June 26, 2007

Respectfully submitted,

By


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Attachments: Figure A

European Action dated February 24, 2004

Response to Action of February 24, 2004 dated July 2, 2004

European Action dated February 14, 2007

Two claim sets